

# Green and Sustainable Remediation (GSR) Applications to Military Munitions Response Program (MMRP) Projects

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US Army Corps of Engineers  
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# Outline

- Green and Sustainable Remediation (GSR) Definition and Drivers
- Army GSR Study
- MMRP Aspects of Study
- Opportunities and Constraints
- Path Forward
- GSR Study Team



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# DEFINITION AND DRIVERS



# DoD Definition of GSR

- Department of Defense (DoD) Green and Sustainable Policy Memorandum dated, August 2009, directs the DoD to employ strategies for environmental cleanups that:
  - ▶ Use natural resources and energy efficiently
  - ▶ Reduce negative impacts on the environment
  - ▶ Minimize or eliminate pollution at its source
  - ▶ Protect and benefit the community at large
  - ▶ Reduce waste to the greatest extent possible
- Use strategies that consider all environmental effects of remedy implementation and operation and incorporate options to maximize the overall environmental benefit of cleanup actions



# Policy and Guidance Drivers



## Federal Register

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Friday,  
January 26, 2007

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### Part II

#### The President

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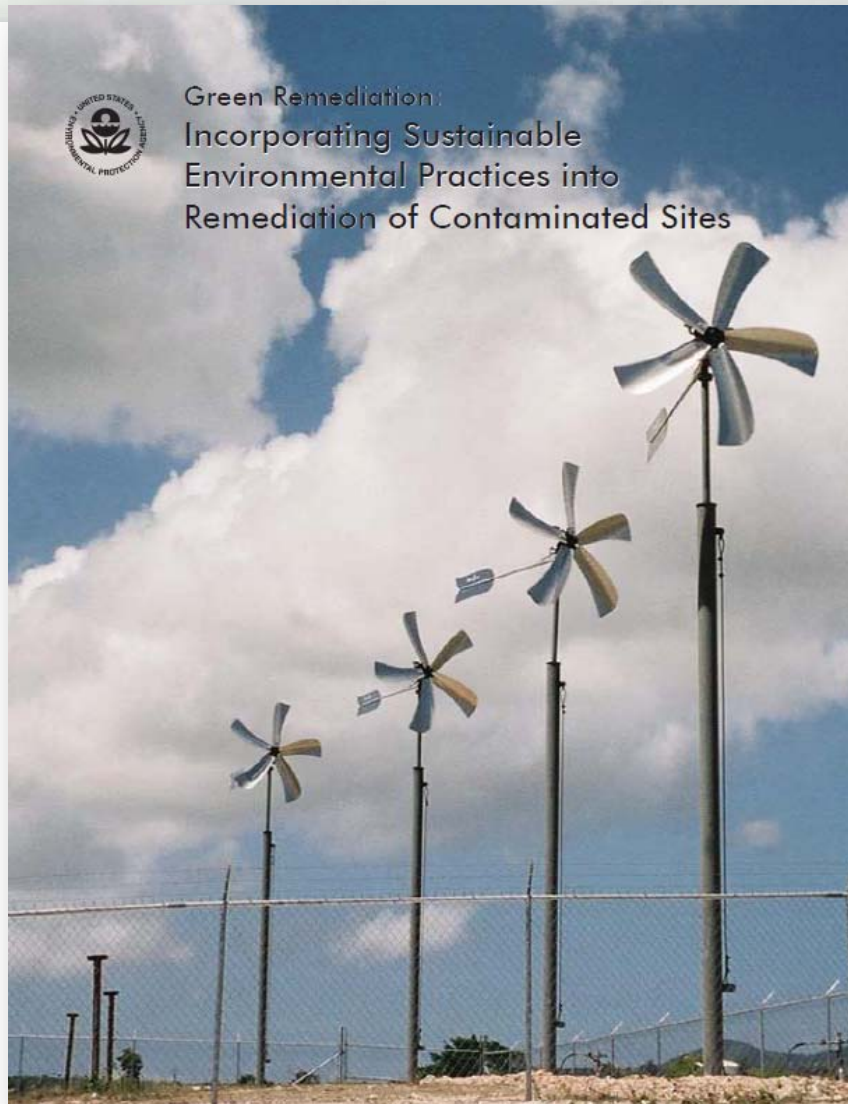
Executive Order 13423—Strengthening  
Federal Environmental, Energy, and  
Transportation Management

Executive Order (EO)  
13423, *Strengthening  
Federal Environmental,  
Energy, and  
Transportation  
Management* (Federal  
Register, 26 January  
2007)





# Policy and Guidance Drivers



Green Remediation:  
Incorporation  
Sustainable  
Environmental Practices  
into Remediation of  
Contaminated Sites  
(EPA, April 2008)



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# Policy and Guidance Drivers



OFFICE OF THE UNDER SECRETARY OF DEFENSE  
3000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3000

AUG 10 2009

ACQUISITION  
TECHNOLOGY  
AND LOGISTICS

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY  
(INSTALLATIONS AND ENVIRONMENT)  
ASSISTANT SECRETARY OF THE NAVY  
(INSTALLATIONS AND ENVIRONMENT)  
ACTING ASSISTANT SECRETARY OF THE AIR FORCE  
(INSTALLATIONS, ENVIRONMENT, AND LOGISTICS)  
DIRECTOR, DEFENSE LOGISTICS AGENCY (DES-E)

SUBJECT: Consideration of Green and Sustainable Remediation Practices in the Defense  
Environmental Restoration Program

The Department of Defense (DoD) currently operates and manages one of the nation's largest environmental restoration programs. DoD continuously evaluates its environmental programs to identify opportunities to improve program performance while achieving the Department's goals of protecting human health, safety, and the environment. The Department is committed to conducting its environmental program in a sustainable manner, consistent with Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*. This Executive Order promotes sustainable conditions, "under which humans and nature can exist in productive harmony, that permits fulfilling the social, economic, and other requirements of present and future generations of Americans." The Department continues to evaluate response alternatives to ensure the "overall protection of human health and the environment." However, as part of the Department's ongoing efforts to implement Executive Order 13423 and reduce its energy demand, the Department is considering additional options for minimizing the environmental impact of existing and future remedial systems.

"Green and sustainable remediation" expands upon the Department's current environmental practices and employs strategies for cleanups that use natural resources and energy efficiently, reduce negative impacts on the environment, minimize or eliminate pollution at its source, protect and benefit the community at large, and reduce waste to the greatest extent possible. Green and sustainable remediation uses strategies that consider all environmental effects of remedy implementation and operation and incorporates options to maximize the overall environmental benefit of cleanup actions.

Opportunities to increase sustainability considerations throughout all phases of remediation (i.e., site investigation, remedy evaluation, design, and construction, operation, monitoring, and site closeout) may exist, regardless of the selected cleanup remedy. Green and sustainable remediation is not new to the Department. Several examples of DoD green remediation efforts are detailed in the Environmental Protection Agency's publication: *Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites*. This publication can be found at: <http://cluoin.org/greenremediation>.



DoD Memorandum,  
*Consideration of Green  
and Sustainable  
Remediation Practices in  
the Defense  
Environmental  
Restoration Program*  
(10 August 2009)



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# Policy and Guidance Drivers



US Army Corps  
of Engineers®

Interim Guidance 10-01  
5 March 2010

ENVIRONMENTAL QUALITY

## DECISION FRAMEWORK FOR INCORPORATION OF GREEN AND SUSTAINABLE PRACTICES INTO ENVIRONMENTAL REMEDIATION PROJECTS



Groundwater recirculation well powered by a wind turbine at the Former Nebraska Ordnance Plant Superfund Site, Mead, NE. Photo by Ernie Gutierrez and used with permission of Curt Elmore, Missouri University of Science and Technology

Environmental and Munitions Center of Expertise  
Interim Guidance

Interim Guidance  
Document (IGD) 10-01:  
*Decision Framework for  
Incorporation of Green  
and Sustainable  
Practices Into  
Environmental  
Remediation Projects*  
(USACE, 5 March 2010)



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# Other Drivers

- Public awareness of a need for sustainable practices
- Often times GSR makes sense (energy conservation, water conservation, and waste minimization typically result in cost savings)
- Showcase GSR examples to DoD, Army, USACE



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# **ARMY GSR STUDY**



# Objectives

1. Follow the consideration and incorporation of GSR practices into 12 Army environmental remediation projects
2. Analyze the effectiveness of the GSR practices that are considered and incorporated
3. Provide procedures by which GSR practices can be identified, considered, implemented and documented by Army project teams
4. Provide recommendations for development of Army-wide GSR policy and guidance



# Study Overview

- 12 Army environmental remediation projects (9 IRP and 3 MMRP):
- Projects chosen to represent multiple Army components
  - ▶ Formerly Used Defense Sites (FUDS)
  - ▶ Base Realignment and Closure (BRAC)
  - ▶ National Guard Bureau (NGB)
  - ▶ Active Army
- Cost impact included
  - ▶ Best Management Practices (BMPs) – cost savings, cost neutral, cost increase
  - ▶ Calculation of costs on remedial option comparison
- DoD directs us to consider and implement GSR “*when and where it makes sense*,” this study attempts to quantify or qualify the “*when and where*”



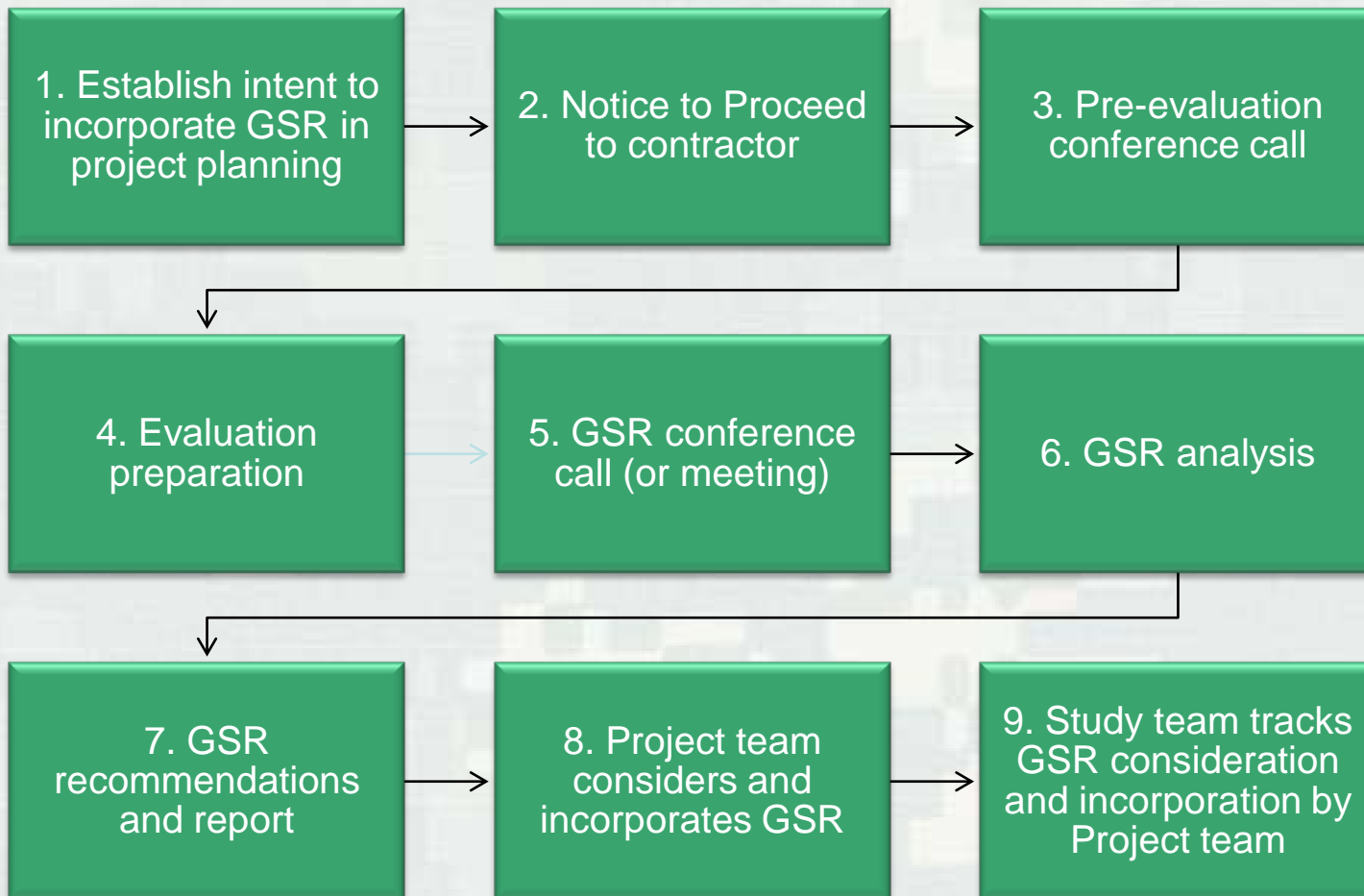
# Study Overview

- **Study Team:** Personnel from the U.S. Army Corps of Engineers (USACE) Environmental and Munitions Center of Expertise (EM CX) and Tetra Tech, Inc.
- **Project Team:** Refers to the team that is executing the individual projects included in the study
- **GSR Team:** Refers to the team performing the GSR evaluation on a project (Tetra Tech, Inc. for the pilot projects, but may be project team or Contractor outside of the study)





# GSR Study Process



# GSR Parameters

- The GSR study evaluation will be based on three quantifiable parameters:
  - ▶ Environmental
  - ▶ Economic
  - ▶ Societal
- These parameters will be quantified and evaluated using SiteWise™ GSR Tool, co-developed by Battelle, the Navy, the Army, and USACE



# GSR Parameters

## ■ Environmental

- ▶ Energy Use
- ▶ Percent of Energy from Renewable Resources
- ▶ Global Warming Potential
- ▶ Criteria Air Pollutants
- ▶ Hazardous or Toxic Air Pollutants
- ▶ Potable Water Use
- ▶ Other Water Use
- ▶ Refined/Unrefined Materials
- ▶ Percent of Refined/Unrefined Materials from Recycled or Reused Sources
- ▶ Non-Hazardous/Hazardous Waste Generation
- ▶ Percent of Total Potential Waste That is Recycled or Reused
- ▶ Land Transferred for Beneficial Use
- ▶ Existing Ecosystem Destruction
- ▶ Time Frame for Land Reuse
- ▶ Flexibility and Breadth of Options for Site Reuse



# GSR Parameters

## ■ Economic

- ▶ Energy Use
- ▶ Life-Cycle Cost, Discounted
- ▶ Life-Cycle Cost, Undiscounted
- ▶ Up-Front Cost



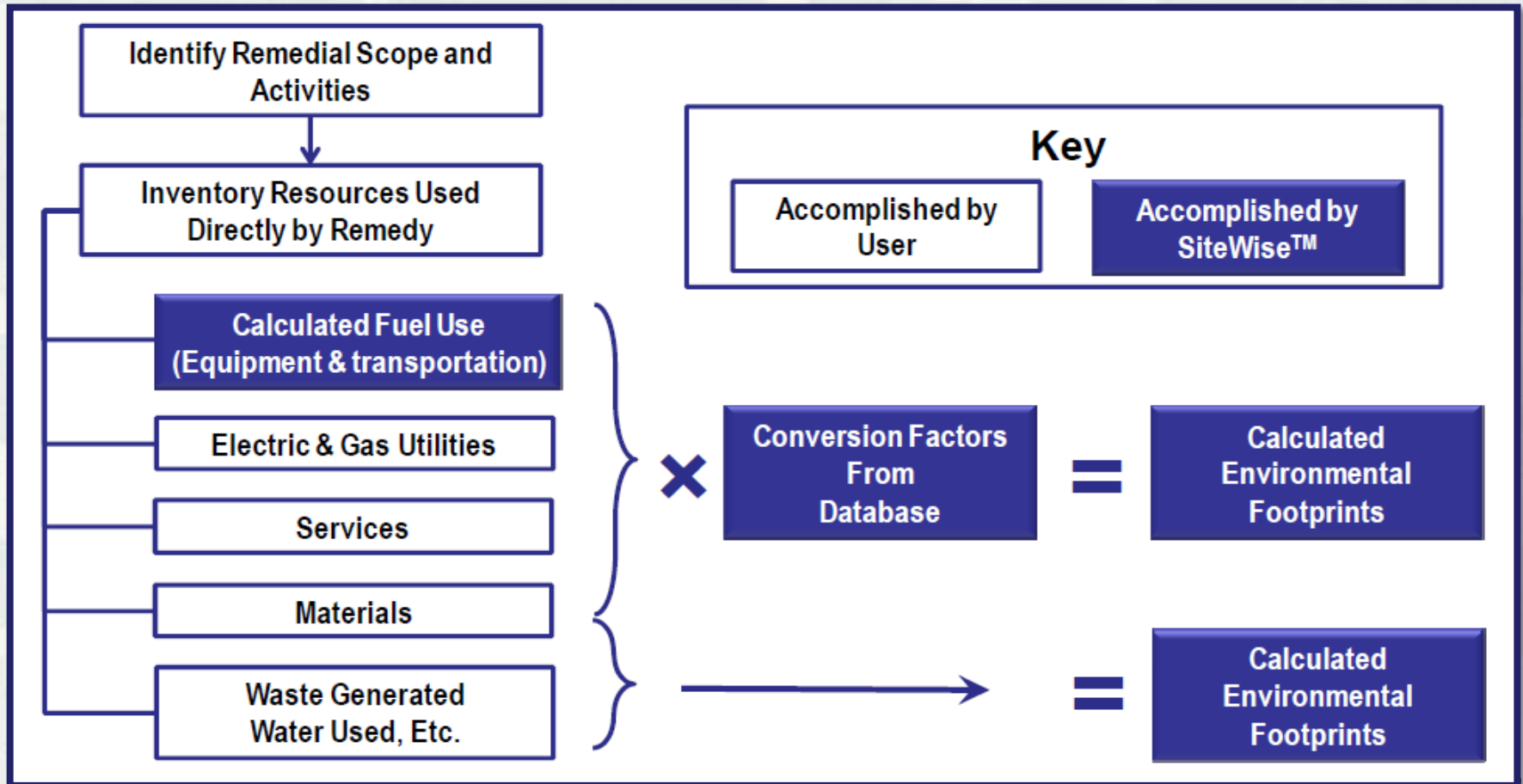
# GSR Parameters

## ■ Societal

- ▶ Increased Risk for On-Site Workers
- ▶ Increased Risk for Transportation
- ▶ One-Way Heavy Vehicle Trips through Residential Areas



# “Footprint” Quantification: SiteWise™





# GSR Best Management Practices (BMPs)

- Many different categories of BMPs
  - ▶ Planning
  - ▶ Characterization and/or Remedy Approach
  - ▶ Energy/Emissions - Transportation
  - ▶ Energy/Emissions - Equipment Use
  - ▶ Materials & Off-Site Services
  - ▶ Water Resource Use
  - ▶ Waste Generation, Disposal, and Recycling
  - ▶ Land Use, Ecosystems, and Cultural Resources
  - ▶ Safety and Community
  - ▶ Other Site-Specific BMPs



# GSR Study Final Report

- Results will be used to determine the following:
  - ▶ GSR practices that make sense (and the circumstances when and where they make sense)
  - ▶ Process that can be used by project teams to consider, incorporate, and document GSR practices (expansion of the process used in the Study to evaluate the projects)
  - ▶ Recommendations for modifications to SiteWise™, including MMRP specific recommendations (Army/Navy/Battelle GSR Evaluation Tool)
  - ▶ Recommendations for performing (and the tools to perform) cost impact of GSR practices
  - ▶ Recommendations for Army-wide GSR policy and guidance
  - ▶ Recommendations for improvements to the USACE Interim Guidance, *“Incorporation of Green and Sustainable Practices into Environmental Remediation Projects”*



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# **MMRP ASPECTS OF STUDY**

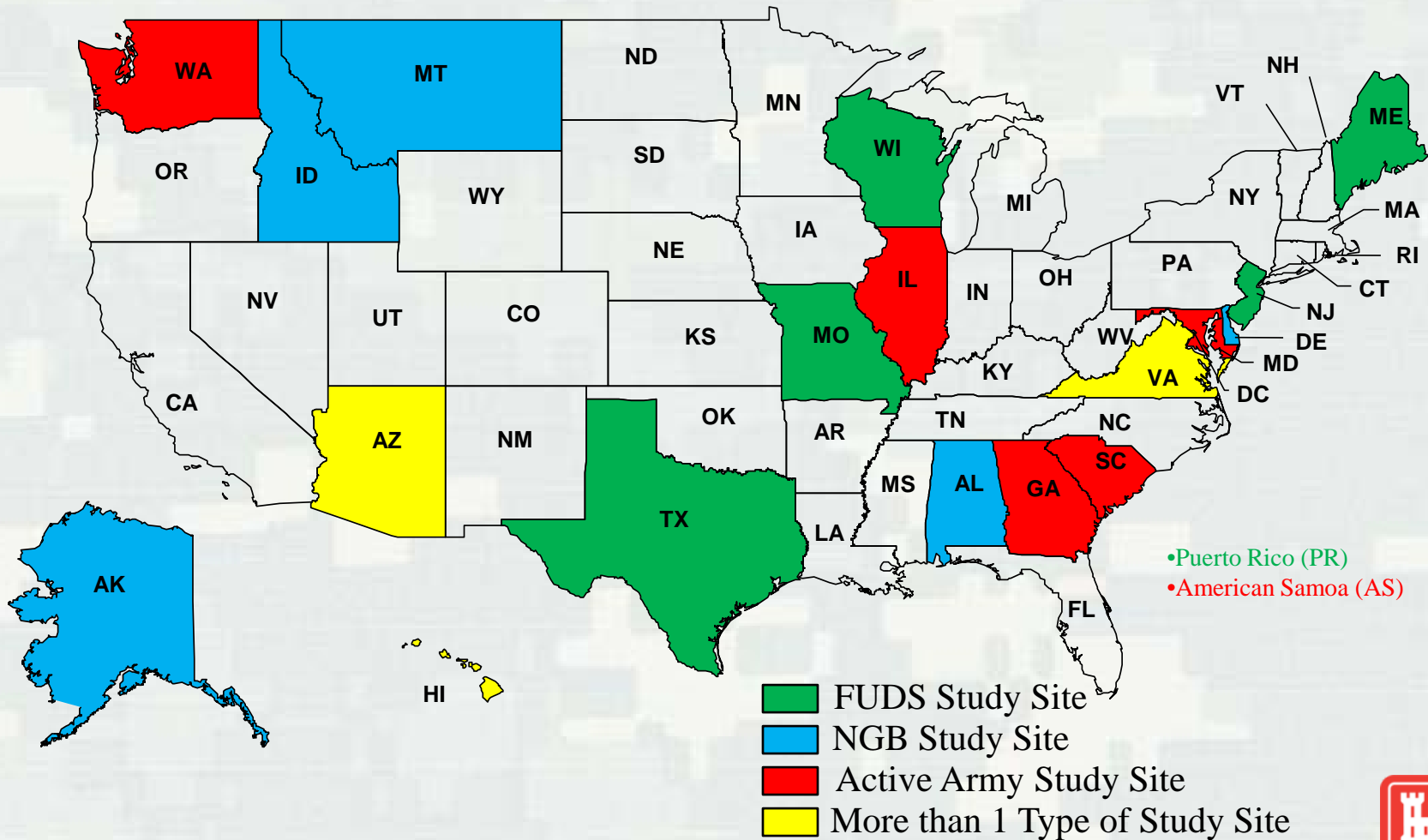


# MMRP Study Activities

- ☑ Reviewed key documents to identify Best Management Practices (BMPs) for GSR for MMRP
- ☑ Reviewed 23 MMRP SIs to document BMPs practiced during the MMRP SI execution for possible future use
- ☑ Generated Study Approach to document BMPs for GSR for MMRP
- ☑ Brainstormed any missing processes with team of experts (November 16, Huntsville)
- ☑ Revising Study approach for GSR in the remedial process to include MMRP
- ☐ Evaluating 3 MMRP pilots in post-SI phases via the Study approach (in progress)
- ☐ Data will be considered for Army and USACE-wide policy and guidance



# MMRP SI GSR Study Site Distribution



# MMRP Findings from SI Review

- MMRP BMPs have significant overlap with IRP
- Many practices in use were consistent with GSR
- Sustainability analysis of many activities will vary based on site-specific conditions
- It was anticipated that some MMRP-specific alternative comparisons would be a valuable aspect of the study





# MMRP Pilot Projects for the GSR Study

Component	Contaminant	Phase
Army (Active)	Munitions and Explosives of Concern (MEC) and Munitions Constituents (MC)	FS
BRAC	MEC and MC	RI/FS
FUDS	Chemical Warfare Material (CWM)	RI/FS



# MMRP Alternative Comparisons

- SiteWise™ is a tool that can be used to compare the “environmental footprint” associated with alternatives for investigation as well as remedial alternatives
- Currently, the tool does not include MMRP-specific parameters; however, the results of the study will be used to make recommendations for future updates



# MMRP Alternative Comparisons

- Investigation techniques
  - ▶ Man-portable vs. vehicle-towed



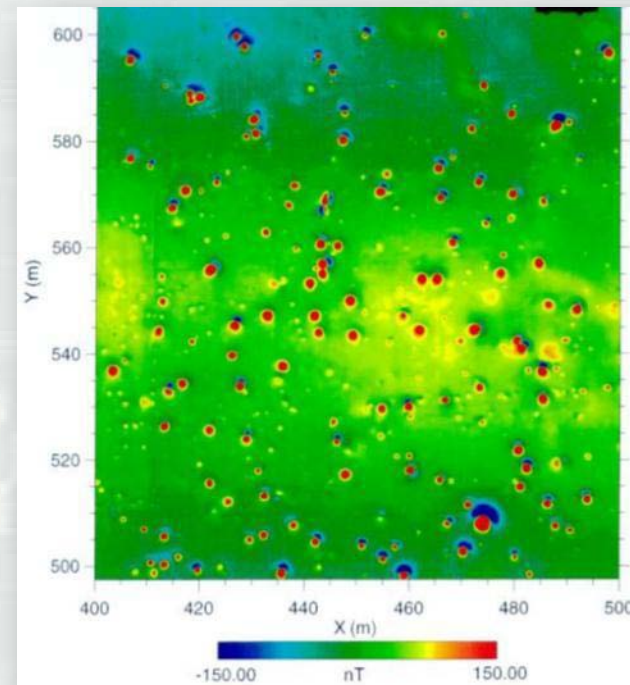
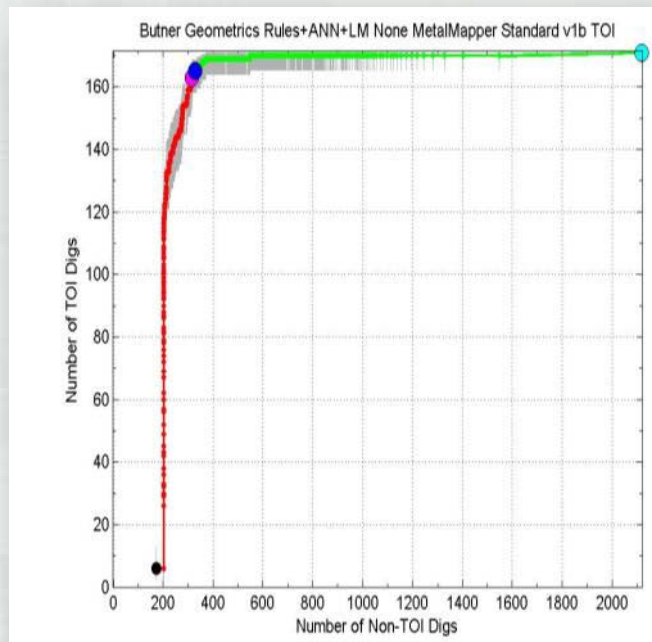
# MMRP Alternative Comparisons

- Anomaly detection
  - ▶ Analog (mag & flag) vs. Digital Geophysical Mapping (DGM)



# MMRP Alternative Comparisons

- Anomaly “dig/don’t dig” decision parameters
  - ▶ Using geophysics-based designs and selection criteria vs. digging everything





# MMRP Alternative Comparisons

- Removal of subsurface anomalies
  - ▶ Mass removal vs. removal to depth with Land Use Controls (LUCs)



# MMRP Alternative Comparisons

- MEC disposal
  - ▶ Detonation chamber vs. consolidated shot





# MMRP Alternative Comparisons

- Remediation of small arms ammunition
  - ▶ Dig and haul vs. dig and sift



# MMRP Alternative Comparisons

- Soil sampling
  - ▶ Incremental sampling vs. discrete sampling
- Handling Chemical Agent (CA) contaminated media
  - ▶ Dig and haul vs. on-site treatment
- Vegetation removal
  - ▶ Manual vs. mechanical



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# **OPPORTUNITIES AND CONSTRAINTS**



# Opportunities

- The GSR study has been discussed with:
  - ▶ Office of Secretary of Defense (OSD)
    - Strategic Environmental Research and Development Program (ESTCP)
    - Environmental Security and Technology Certification Program (SERDP)
  - ▶ Naval Facilities Engineering Command (NAVFAC)
  - ▶ Air Force Center for Engineering and the Environment (AFCEE)
- To date, other services have not pursued GSR on MMRP projects



# Constraints

- Retrofitting GSR into on-going projects
  - ▶ Contractor and project team financial support
    - A contract modification may be necessary (1 MMRP project needed a mod)
    - \$3k – \$6k project contractor support/project where needed
    - \$3k – \$7k/project team support/project
  - ▶ Agreement of regulators that GSR incorporation does not require re-review of project documents
- How to document GSR
  - ▶ Typical: A summary in project documents, GSR evaluation report referenced in administrative record
- Project funding and/or schedule
  - ▶ GSR study needs to adapt (speed up, slow down) to not interfere with project schedule
- Cost impact
  - ▶ cost decrease and cost neutral OK, cost increase questionable



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# **PATH FORWARD**



# Path Forward

- Complete the GSR report for the 3 MMRP pilot projects
- Analyze the outcomes, common themes, and lessons learned from the pilot projects
- Complete the GSR study report which will include recommendations for Army-wide GSR policy and guidance





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# **STUDY TEAM**



## Office of the Assistant Chief of Staff for Installation Management (OACISM)

- Kevin Roughgarden

## USACE Environmental and Munitions Center of Expertise (EM CX)

- Carol Dona (PM)
- Nick Stolte and Deborah Walker (MMRP)

## Tetra Tech, Inc. (Contractor to USACE)

- Rob Greenwald (project manager)
- Doug Sutton (IRP GSR lead)
- Michelle Caruso (MMRP GSR lead)

## Others

- National Guard Bureau (NGB)
- Army Environmental Command (AEC)
- Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health [DASA(ESOH)]
- Formerly Used Defense Sites (FUDS)
- Military Munitions Support Services (M2S2)
- USACE Engineering and Support Center, Huntsville
- Army Environmental Policy Institute (AEPI)

# Questions?

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